CLAIMS

What Is Claimed Is:

1. A method for removing solids from an influent liquid comprising the steps of:

   a) directing the influent liquid to a coagulation zone and mixing therein a coagulant with the influent liquid to form a mixed liquid;

   b) adding an insoluble granular material having a density greater than the influent liquid;

   c) directing the mixed liquid to an intermediate zone and mixing the liquid so as to maintain the granular material in suspension within the intermediate zone;

   d) directing the mixed liquid to a sedimentation tank having no separator plates disposed therein and separating the granular material and solids from the mixed liquid through a settling process resulting in settled sludge being formed in a lower portion of the sedimentation tank;

   e) maintaining within the sedimentation tank an average mirror rate greater than 15 m/h while producing a clarified effluent having at least a 60% reduction in suspended solids relative to the influent liquid; and

   f) directing the settled sludge from the sedimentation tank to a separation zone and separating the granular material from the sludge and recycling the granular material through the sedimentation process.

2. The method of claim 1 including the step of maintaining within the sedimentation tank an average mirror rate of at least 35 m/h while producing clarified effluent having at least a 65% reduction in suspended solids relative to the influent liquid.

3. The method of claim 1 including the step of maintaining within the sedimentation tank an average mirror rate of at least 90 m/h while producing clarified effluent having at least a 70% reduction in suspended solids relative to the influent liquid.

4. The method of claim 1 wherein said influent liquid is wastewater.

5. The method of claim 1 wherein said influent liquid is untreated water.

6. The method of claim 1 wherein said granular material is sand.

7. The method of claim 6 wherein said sand has a mean particle size of between approximately 20 μm and 300 μm.

8. The method of claim 7 wherein said sand has a mean particle size of between 100 μm and 200 μm.

9. The method of claim 1 including the step of producing speed gradients in the intermediate zone in the range of 70 s^{-1} to 450 s^{-1}.

10. The method of claim 1 including the step of producing speed gradients in the intermediate zone in the range of 150 s^{-1} to 250 s^{-1}.

11. The method of claim 1 wherein the intermediate zone includes a flocculation zone and a maturation zone; and wherein the process further includes the step of directing a flocculation agent into the flocculation zone and mixing the mixed liquid and the

flocculation agent therein prior to the mixed liquid being directed to the maturation zone.

12. The method of claim 11 further comprising the step of directing a flocculation agent into the maturation zone.

13. The method of claim 11 including the step of directing the granular material into the flocculation zone and mixing the granular material with the mixed liquid within the flocculation zone.

14. The method of claim 13 including producing speed gradients within the flocculation zone in the range of 100 s^{-1} to 450 s^{-1} and producing speed gradients within the maturation zone in the range of 70 s^{-1} to 300 s^{-1}.

15. The method of claim 11 wherein the maturation zone is disposed generally at the center of the sedimentation tank.

16. The method of claim 1 including directing the mixed liquid from the intermediate zone along a circular outer wall that forms a part of the sedimentation tank such that the mixed liquid flows around the sedimentation tank in a cyclonic fashion.

17. The method of claim 16 further including the step of directing liquid from the sedimentation tank upwardly through an open bottom central flow chamber disposed generally centrally within the sedimentation tank and out the flow chamber to a point exterior to the sedimentation tank.

18. The method of claim 1 wherein there is provided a flow directing baffle, having a lower terminal edge, interposed between the intermediate zone and an outlet associated with the sedimentation tank, and further comprising the step of directing the mixed liquid from the intermediate zone around a lower terminal edge of said flow directing baffle in an unrestricted manner.

19. The method of claim 18 wherein the intermediate zone includes an outer wall structure that is disposed in general parallel relationship with the flow directing baffle, and wherein the lower terminal edge of the baffle is spaced with respect to the sedimentation tank such that flow around the lower terminal edge of the baffle and between the baffle and the sedimentation tank is unrestricted.

20. A method for removing solids from an influent liquid carried out in a sedimentation system having an intermediate mixing zone, a sedimentation tank, and a flow directing baffle disposed between the intermediate mixing zone and the sedimentation tank and which defines downflow and upflow zones on opposite sides of the baffle, the method comprising the steps of:

a) directing an influent liquid to a coagulation zone and mixing a coagulant with the influent liquid so as to form a mixed liquid;

b) adding an insoluble granular material having a density greater than the density of the influent liquid;

c) directing the mixed liquid to an intermediate zone and maintaining the granular material in suspension within the intermediate zone;

d) directing the mixed liquid from the intermediate zone to the sedimentation tank and directing the liquid downwardly through the downflow zone and around the lower terminal edge of the flow directing baffle in an unrestricted manner;

e) separating the granular material and solids from the mixed liquid through a settling process as the liquid moves within the sedimentation tank resulting in settled sludge being formed in a lower portion of the sedimentation tank; and

f) directing the settled sludge from the sedimentation tank to a separation zone and separating the granular material from the sludge and recycling the granular material through the sedimentation process.

21. The method of claim 20 further comprising the step of directing a flocculation agent to the intermediate zone.

22. The method of claim 20 wherein at least a portion of the intermediate zone is disposed centrally within the sedimentation tank and wherein the intermediate zone includes a chamber having a surrounding wall structure that lies in general parallel relationship with the flow directing baffle.